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(54) LIGHT INTERFERENCE BODY, BULB, REFLECTIVE BULB AND ILLUMINATOR

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a light interference body with multilayered light interference films having improved adhesive strength and capable of suppressing cracking and peeling even at high temp. by forming specified multilayered interference films on both the front and rear sides of a transparent substrate.

SOLUTION: Multilayered light interference films 2 are formed on both the inner and outer faces of a glass bulb l by alternately laminating high refractive index layers 2H each based on a TiO2-Ta2O5 mixture and properly contg. a vitrifying substance such as P or B and low refractive index layers 2L each based on Sin. and properly contg. a vitrifying substance such as P or B and at least one of Tie. and Ta2O5 so that 7-11 layers are laminated on each of the faces and 14-22 layers are laminated on

both the faces. When the thickness of each of the layers 2H, 2L is made proper, the films 2 transmit visible light and reflect IR by light interference.

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CLAIMS

[Claim(s)]

[Claim 1] Translucency substrate; the optical interference object characterized by to provide the multilayer light interference film which uses as a principal component the high refractive-index layer and the silicon oxide which formed titanium oxide and the mixture of tantalum oxide in front flesh-side both sides of this translucency substrate as a principal component, and comes to carry out mutual multistory [of the low refractive-index layer which this was made to contain at least one sort of the titanium oxide corresponding to the principal component of the above-mentioned quantity refractive-index layer, or tantalum oxide, and was formed in it], and;.

[Claim 2] The optical interference object according to claim 1 characterized by for a low refractive-index layer containing at least one sort of 15 - 30% of the weight of titanium oxide, or tantalum oxide, and forming it to silicon oxide.

[Claim 3] The bulb which an optical interference object according to claim 1 or 2 is a glass bulb, and is characterized by ****(ing) light-emitting part material in this bulb.

[Claim 4] The bulb according to claim 3 or 4 characterized by light-emitting part material consisting of a coiled form filament or a discharge electrode.

[Claim 5] It is the reflex bulb characterized by arranging the bulb corresponding to a reflecting mirror while an optical interference object according to claim 1 or 2 is a glass bulb and light-emitting part material is ****(ed) in this bulb.

[Claim 6] The reflex bulb which an optical interference object according to claim 1 or 2 is a reflecting mirror, and is characterized by arranging the bulb in this reflecting mirror.

[Claim 7] The reflex bulb which optical interference objects according to claim 1 or 2 are a glass bulb and a reflecting mirror, and is characterized by arranging the bulb in this reflecting mirror.

[Claim 8] The reflex bulb according to claim 5 to 7 characterized by light-emitting part material consisting of a coiled form filament or a discharge electrode.

[Claim 9] The lighting system which an optical interference object according to claim 1 or 2 is a covering member, and is characterized by being prepared in opening of the case which held the bulb and the reflector.

[Claim 10] This reflector that an optical interference object according to claim 1 or 2 is a reflecting mirror, and arranged the bulb in the interior is a lighting system characterized by holding in a case.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the optical interference object in which the optical film which consists of multilayer light interference film which carried out multistory [of a high refractive-index layer and the low refractive-index layer] by turns was formed to front flesh-side both sides of a translucency substrate, a bulb, a reflex bulb, and a lighting system.

[0002]

[Description of the Prior Art] By arranging a coiled form filament along with the center line of a tubing form glass bulb, and preparing for example, the light transparency infrared reflective film in one [at least] field among inside-and-outside both sides of a bulb, reflecting infrared radiation by this reflective film among the light emitted from the filament, and making it return to a filament, while heating a filament and raising luminous efficiency, the tungsten halogen lamp which reduced the infrared radiation in synchrotron orbital radiation is known.

[0003] Such light transparency infrared reflective film is what carried out a total of 20-40-layer mutual multistory [of the low refractive-index layer which consists of a high refractive-index layer which consists of titanium oxide etc., silicon oxide, etc.], and formed it, by having regulated the thickness of a layer suitably, uses interference of light, and penetrates or reflects the light of a desired wavelength region alternatively. Then, such optical film is called the multilayer light interference film.

[0004] However, the transmission and the reflection factor by optical interference became high, so that the number of layers was made [many] in such multilayer light

interference film, but on the other hand it becomes easy to generate a crack and exfoliation on the optical interference film according to the thermal expansion coefficient difference of the ingredient which forms a bulb, a high refractive-index layer, and a low refractive-index layer, and the fall of a property was caused. Especially, since bulb temperature became high in an above-mentioned tungsten halogen lamp at the time of lighting, it was easy to generate a crack and exfoliation on the optical interference film, and since a crack and exfoliation were prevented by lessening the number of layers, the decline in luminous efficiency could not be escaped.

[0005] These applicants a high refractive-index layer as this cure On the other hand, titanium oxide, By having used at least one sort of tantalum oxide and a zirconium dioxide as the principal component, and the low refractive-index layer's having used silicon oxide as the principal component, and having made this contain strain relaxation matter, such as Lynn and boron Internal distortion which originates in the coefficient-of-thermal-expansion difference of both layers, and is generated in a layer was eased, the technique of preventing the crack of the multilayer light interference film by this was developed, and it proposed as Japanese Patent Application No. No. 221942 [59 to], and Japanese Patent Application No. No. 242996 [60 to].

[0006] Although the crack resulting from the coefficient-of-thermal-expansion difference of both layers decreased sharply with the technique of above-mentioned Japanese Patent Application No. No. 221942 [59 to], and a Japanese-Patent-Application-No. No. 242996 [60 to] proposal, interlaminar peeling in the film does not yet come to decrease fully, and one more step of cure is demanded. It generates also on the die clo IKKU film of the comparatively low electric bulb with a reflecting mirror of temperature, and especially interlaminar peeling has been a failure when this increases a number of layers.

[0007] Moreover, adding tin oxide or a zirconium dioxide to silicon oxide is indicated by JP,57-124301,A as a means which raises the endurance of the silicon oxide film which forms the multilayer light interference film. A high refractive-index layer is formed in this JP,57-124301,A with 1 of an aluminum oxide, a zirconium dioxide, and titanium oxide, or such mixture, and a low refractive-index layer makes it add and contain at least one sort in tin oxide or a zirconium dioxide in silicon oxide in the multilayer light interference film which carried out mutual multistory [of a high refractive-index layer and the low refractive-index layer] to substrate front faces, such as a glass plate, and formed them in them.

[0008] However, what is indicated by this official report is related to the ingredient component of a high refractive-index layer, and has not chosen the additive to a low

refractive-index layer. That is, it becomes the inclination for an optical property [fall / since a refractive index becomes low / although it thought also when a zirconium dioxide and low refractive-index layer made silicon oxide add / layer / high refractive-index / a zirconium dioxide as selection of an ingredient, when a zirconium dioxide is used as a high refractive-index layer in a bulb / titanium oxide or tantalum oxide /, the difference of a refractive index with a low refractive-index layer becomes small, and / an infrared reflection factor] to get worse and is not desirable.

[0009] In this case, although it was possible to increase the total number of layers in order to have raised the optical property, as compared with titanium oxide or tantalum oxide, it becomes easy to generate interlaminar peeling, and this was not desirable.

[0010]

[Problem(s) to be Solved by the Invention] Then, artificers applied for the bulb equipped with the multilayer light interference film which formed the high refractive-index layer by titanium oxide or tantalum oxide previously, was made to contain titanium oxide and tantalum oxide which are a high refractive-index stratification ingredient considering silicon oxide as a principal component about a low refractive-index layer at this, and was formed as Japanese Patent Application No. No. 210239 [62 to].

[0011] The configuration of this application, then association with a chemical height refractive-index layer were produced, the adhesion force between both layers improved, and interlaminar peeling has been prevented.

[0012] However, efficient-izing of the bulb of ******, the miniaturization of a reflecting mirror and instruments, etc. are achieved, and it sets to an above-mentioned tungsten halogen lamp especially in recent years. Since buld wall loading increases and an instrument inner point LGT is carried out further, bulb temperature may amount even to about 850 degrees C highly. Moreover, by having been minor-diameter-ized, curvature increases, it is easy to generate a crack and exfoliation on the multilayer light interference film as ****** in the thing of covering stress declining, and the bulb of a coat forming face is also becoming. On the other hand, even if it increases the total number of layers, using titanium oxide and silicon oxide for front flesh-side both sides of a substrate, and forming the multilayer light interference film is known as a means to suppress generating of interlaminar peeling. When a substrate is immersed into a coat formation solution and it forms a coat, since a solution puts it on front flesh-side both sides of a substrate by one immersion and a two-layer coat is made as for it to coincidence, this [workability's] is good, and has the advantage to which the thing of homogeneity is mostly made also as for coating thickness.

[0013] Then, the result to which this invention person studied heavy loads, such as such a glass bulb, and the multilayer light interference film with which it can respond to that from which it becomes high temperature, The ingredient which uses as titanium oxide and the mixture of tantalum oxide the ingredient which forms a high refractive-index layer, and forms a low refractive-index layer to silicon oxide The thing of titanium oxide or tantalum oxide for which the content is readjusted while making a kind contain at least, By forming a coat in front flesh-side (front flesh side) both the front faces of a substrate at coincidence, the total number of layers reduced by half the number of layers formed in the same front face which is one side but, and prevented a crack and exfoliation, and it found out that the strength in high temperature of the multilayer light interference film of ****** could improve.

[0014] This invention aims at offering the optical interference object and bulb which have the multilayer light interference film which can cancel a crack, exfoliation, etc. of a coat under an elevated temperature, and whose covering reinforcement improved, and a lighting system.

[0015]

[Means for Solving the Problem] The optical interference object of this invention according to claim 1 to front flesh-side both sides of a translucency substrate and this translucency substrate Titanium oxide and mixture of tantalum oxide are used as a principal component. It is characterized by providing the multilayer light interference film which uses as a principal component the high refractive-index layer and silicon oxide which were formed, and comes to carry out mutual multistory [of the low refractive-index layer which this was made to contain at least one sort of the titanium oxide corresponding to the principal component of the above-mentioned quantity refractive-index layer, or tantalum oxide, and was formed in it].

[0016] Since the high refractive-index layer and the low refractive-index layer which constitute the multilayer light interference film are making the same titanium and the same tantalum as a formation component of a high refractive-index layer contain in the silicon oxide which forms a low refractive-index layer although great difference is in coefficient of thermal expansion, the titanium atom in a high refractive-index layer and the titanium atom in a low refractive-index layer have chemical association through an oxygen atom, and, for this reason, its adhesion force between both refractive-indexes layers is improving.

[0017] Since two-layer can carry out a coat in and abroad in one formation to substrate table flesh-side both sides at coincidence, while the activity is easy, thickness can also obtain the thing of homogeneity.

[0018] Since there are few coat number of layerses in the whole surface, an optical interference object can obtain the firm coat which can be borne even if distortion between each class is small, and the adhesion force between layers is high and the temperature of the optical interference film carries out a temperature up even to about 900 degrees C.

[0019] The optical interference object of this invention according to claim 2 is characterized by for a low refractive-index layer containing at least one sort of 15 - 30% of the weight of titanium oxide, or tantalum oxide, and forming it to silicon oxide.

[0020] Although there were a crack and the exfoliation prevention effectiveness so that according to the experiment a crack and interlaminar peeling generated it when the amount of the titanium oxide added to silicon oxide became an elevated temperature (about 850 degrees C) at less than 15 % of the weight, and the amount of titanium oxide increased, when 30 % of the weight was exceeded, the refractive index became high, the optical property fell, and 15 - 30% of the weight of the range of the content was good.

[0021] An optical interference object according to claim 1 or 2 is a glass bulb, and the bulb of this invention according to claim 3 is characterized by ****(ing) light-emitting part material in this bulb.

[0022] A translucency substrate is the glass bulb of an electric bulb or a discharge lamp, and does a publication and the same operation so to above-mentioned claim 1 and claim 2. For example, when the optical interference object formed in the front face of the bulb of an electric bulb is the light transparency infrared reflective film, only the light is emitted out of a bulb, and the infrared radiation reflected with the coat returns to a filament, and does so the operation which heats a filament further and raises luminescence.

[0023] The bulb of this invention according to claim 4 is characterized by light-emitting part material consisting of a coiled form filament or a discharge electrode.

[0024] A bulb is the discharge lamp made to discharge by the electric bulb which makes a filament emit light, or inter-electrode [which carried out opposite arrangement], and does a publication and the same operation so to above-mentioned claim 3.

[0025] The optical interference object according to claim 1 or 2 of the reflex bulb of this invention according to claim 5 is a glass bulb, and while light-emitting part material is ****(ed) in this bulb, it is characterized by arranging the bulb corresponding to a reflecting mirror.

[0026] A translucency substrate is the glass bulb of an electric bulb or a discharge lamp, and while doing a publication and the same operation so to above-mentioned claim 1 and claim 2, most synchrotron orbital radiation from an electric bulb or a discharge

lamp is pointed to it and reflected in the predetermined direction by the reflecting mirror which has all light reflex sides, such as aluminum.

[0027] An optical interference object according to claim 1 or 2 is a reflecting mirror, and the reflex bulb of this invention according to claim 6 is characterized by arranging the bulb in this reflecting mirror.

[0028] From an electric bulb or a discharge lamp, only the beam of light of predetermined wavelength points to the beam of light which carried out incidence to the reflecting mirror in the predetermined direction, and it is reflected, and other beams of light (needlessness) penetrate a reflecting mirror, and are emitted to the tooth-back side of a reflecting mirror. For example, when the optical interference object formed on the surface of the reflecting mirror is the light reflective infrared transparency film, the light is emitted to the front side of a reflecting mirror, infrared radiation is emitted to a tooth-back side, and the heat ray by the side of the front can be reduced.

[0029] Optical interference objects according to claim 1 or 2 are a glass bulb and a reflecting mirror, and the reflex bulb of this invention according to claim 7 is characterized by arranging the bulb in this reflecting mirror.

[0030] The electric bulb which formed the light transparency infrared reflective film in the same bulb with having done the same operation so with the publication to above-mentioned claim 6, for example, having indicated to above-mentioned claim 3, When the reflecting mirror in which the same light reflective infrared transparency film was formed is combined with having indicated to above-mentioned claim 6, according to both operation, the light is emitted to the front side of a reflecting mirror, infrared radiation is emitted to a tooth-back side, and the heat ray by the side of the front can be reduced further.

[0031] The reflex bulb of this invention according to claim 8 is characterized by light-emitting part material consisting of a coiled form filament or a discharge electrode.

[0032] A reflex bulb is the discharge lamp made to discharge by the electric bulb which makes a filament emit light, or inter-electrode [which carried out opposite arrangement], and does a publication and the same operation so to above-mentioned claim 5 thru/or claim 7.

[0033] An optical interference object according to claim 1 or 2 is a covering member, and the lighting system of this invention according to claim 9 is characterized by being prepared in opening of the case which held the bulb and the reflector.

[0034] Only the beam of light of a predetermined wavelength region can be made to emit from a covering member among the synchrotron orbital radiation from a bulb. For example, radiation out of the equipment (instrument) of ultraviolet rays can be

intercepted by forming in the front face of a covering member the ultraviolet-rays cut-off filter which consists of multilayer light interference film.

[0035] It is characterized by holding in a case this reflecting mirror with which the lighting system of this invention according to claim 10 is a reflecting mirror, and the optical interference object according to claim 1 or 2 arranged the bulb in the interior.

[0036] By forming the multilayer light interference film on the surface of a reflecting mirror, the same operation is done so with a publication to above-mentioned claim 6 and claim 7.

[0037]

[Embodiment of the Invention] The gestalt of operation of the 1st of this invention is explained with reference to a drawing below. the piece to which drawing 1 comes to apply this invention -- a mouthpiece -- an example of the form tungsten halogen lamp L1 is shown -- a cross-section front view and drawing 2 are the model-expanded sectional views showing the multilayer light interference film formed in the bulb front face a part.

[0038] The tubing form (T form) bulb of heat-resistant translucency by which one consists of quartz glass, alumino silicate glass, etc., the multilayer light interference film which 2 and 2 penetrate the light formed in inside-and-outside (front flesh side) both sides of this bulb 1, respectively, and reflects infrared radiation, and 3 are the closure sections which come to carry out crushing closure of the edge of a bulb 1 among drawing. One pair of molybdenum installation foils with which 4 and 4 were laid underground in this closure section 3, one pair of inner lead wire which connected 5 and 5 to these installation foils 4 and 4, and was introduced into the both ends in a bulb 1, respectively, While 6 is arranged along with the center line of a bulb 1, the coiled form filament, i.e., light-emitting part material, which wound the tungsten wire with which the edge was ****(ed) by these inside lead wire 5 and 5, and 7 are the mouthpieces with which the edge of a bulb 1 was equipped. And in the bulb 1, the necessary halogen is enclosed with inert gas, such as an argon. In addition, 11 is the exhaust pipe formed in the crowning of a bulb 1.

[0039] As the cross section is expanded and shown in drawing 2 in model, the above-mentioned multilayer light interference film 2 Mixture of titanium oxide and tantalum oxide is used as a principal component on the inside-and-outside front face of a bulb 1. The high refractive-index layers 21 and 21 and silicon oxide which make this come to contain vitrification matter, such as Lynn and boron, suitably are used as a principal component. It carries out a total of 14-22-layer mutual multistory [of the low refractive-index layer 2L which makes this come to contain at least one sort of

vitrification matter, such as Lynn and boron, the titanium oxide corresponding to the principal component of quantity refractive-index layer 2H, and tantalum oxide suitably] in respect of 7-11 layers of one side, and both sides. And by [of 2L, 2L, and --] having made thickness suitable, the light is penetrated by interference of light and it has both the layers 2H and 2H, --, the property to reflect infrared radiation.

[0040] Below, an example of the formation approach of this optical interference film 2 is explained. First, the bulb 1 of a tubing form which consists of quartz glass used for above-mentioned tungsten halogen lamp L is prepared. The titanium tantalum mixed solution which dissolves a titanium compound and tantalum compounds, such as a titanium alkoxide, in an alcohols solvent with alcoholic fusibility compounds, such as Lynn and boron, and has predetermined concentration and predetermined viscosity next is adjusted. Moreover, water is made to react to organic silicon compounds, such as alkoxysilane, conversion is carried out to an alkoxysilane condensation product solution, and the silicon and titanium mixed solution which blends about 20% of the weight of an organic titanium compound with this to the above-mentioned organic silicon compound with alcoholic fusibility compounds, such as Lynn and boron, dissolves in an alcohols solvent, and has predetermined concentration and predetermined viscosity are adjusted.

[0041] And it is immersed in a titanium tantalum mixed solution, the above-mentioned tubing form bulb 1 is pulled up at a predetermined rate, the solution spreading film is formed in inside-and-outside both the front faces of the tubing form bulb 1, and it calcinates for about 10 minutes at the temperature of about 500-600 degrees C in after [desiccation] air. Then, a titanium compound, an tantalum compound, and compounds, such as Lynn and boron, are disassembled into inside-and-outside both the front faces of a bulb 1, titanium oxide and tantalum oxide are used as a principal component, and quantity refractive-index layer 2H which come to contain oxides, such as Lynn and boron, are formed in this. Subsequently, it is immersed in silicon and a titanium mixed solution, the bulb 1 which did in this way and formed quantity refractive-index layer 2H is pulled up at a predetermined rate, the solution spreading film is formed in inside-and-outside both the front faces of a bulb 1, and it calcinates for about 10 minutes at the temperature of about 500-600 degrees C in after [desiccation] air. Then, a compound and organic titanium compounds, such as an organic silicon compound, Lynn, and boron, are disassembled into inside-and-outside both the front faces of a bulb 1, silicon oxide is used as a principal component, and low refractive-index layer 2L which comes to contain the oxide of Lynn, boron, and titanium is formed in this.

[0042] Thus, if quantity refractive-index layer 2H and low refractive-index layer 2L are formed by turns, the multilayer optical interference film 2 of the thickness of this

thickness can be mostly formed in inside-and-outside both the front faces of a bulb 1 at coincidence. Then, the thickness of both the refractive-indexes layers 2H and 2L is manageable to arbitration by adjusting the concentration and viscosity of a titanium tantalum mixed solution, or a silicon and a titanium mixed solution.

[0043] Thus, since the bulb 1 by which the multilayer light interference film 2 was formed is mixed in the glass which the interference film 2 fused and faults, such as a crack, are produced, after the interference film 2 of closure section 3 part exfoliates, a closure activity is started and the closure section 3 is formed. And the inside of a bulb 1 is exhausted through an exhaust pipe 11, inert gas, such as a predetermined halogenide and an argon, is enclosed, an exhaust pipe 11 is ****(ed), a mouthpiece 7 is joined to the closure section 3 side if needed, and a tungsten halogen lamp L1 is completed.

[0044] Thus, as for the obtained tungsten halogen lamp L1, among the light emitted from the coiled form filament 6, that of the multilayer light interference film 2 by the side of bulb 1 inside and a bulb 1 penetrates the multilayer light interference film 2 by the side of **** and bulb 1 external surface, the light is emitted outside, and it is reflected by the optical interference film 2, and infrared radiation returns to the coiled form filament 6, heats a filament 6 further, and raises luminous efficiency. Therefore, this tungsten halogen lamp L1 is efficient, and, moreover, has an advantage with little infrared radiation in the synchrotron orbital radiation to the method of the outside of a bulb 1.

[0045] And quantity refractive-index layer 2H and low refractive-index layer 2L have great difference in coefficient of thermal expansion, and, moreover, the tungsten halogen lamp L1 of illustration is heated during lighting by the elevated temperature with an extraordinary bulb 1. However, since all of quantity refractive-index layer 2H and low refractive-index layer 2L contain strain relaxation matter, such as Lynn and boron, in the electric bulb L1 concerning this invention, the distortion in the layer resulting from the coefficient-of-thermal-expansion difference of both the layers 2H and 2L is eased, and crack initiation can be prevented.

[0046] Moreover, it sets on the electric bulb L1 shown in the gestalt of this operation. Since the titanium high [the mixolimnion of the titanium oxide and tantalum oxide which form quantity refractive-index layer 2H] a refractive index and same in the silicon oxide which forms low refractive-index layer 2L as the formation component of quantity refractive-index layer 2H is contained the titanium atom in high refractive-index layer 2H, and the titanium atom in low refractive-index layer 2L -- an oxygen atom -- minding -- chemical association -- having -- this sake -- both -- the adhesion force between refractive-index layer 2H and 2L is improving.

[0047] The electric bulb L1 concerning this invention therefore, by having formed the number of layers of the optical interference film 2 on the surface of [of a bulb 1] inside and outside Distortion which the number of layers by the side of a field reduces by half on the other hand, and is produced between class 2H and 2L decreases. both -- even if generating of exfoliation between refractive-index layer 2H and 2L was lost and it switched on the light over a long period of time, there was no trouble, and even if the temperature of the optical interference film 2 carried out the temperature up even to about 900 degrees C, neither a crack nor exfoliation was produced on the optical interference film 2, but the outstanding multilayer light interference film 2 of an optical property and thermal resistance was obtained.

[0048] In addition, the amount of the same titanium oxide as the constituent of quantity refractive-index layer 2H made to contain in the silicon oxide which constitutes low refractive-index layer 2L in the tungsten halogen lamp L1 shown in drawing 1 According to the experiment, at less than 15 % of the weight, although there were a crack and the exfoliation prevention effectiveness so that a crack and interlaminar peeling occurred and the amount of titanium oxide increased when it became an elevated temperature (about 850 degrees C), when 30 % of the weight was exceeded, the refractive index became high, the optical property fell, and 15 - 30% of the weight of the range of the content was good.

[0049] Moreover, what is necessary is to be what made the subject two components of titanium oxide and tantalum oxide as a formation ingredient of a high refractive-index layer, to double the mixed rate with the optics demanded, a luminescence property, temperature conditions, etc., and just to decide it suitably, although the gestalt of the above-mentioned implementation constituted the principal component for the high refractive-index layer from titanium oxide and tantalum oxide.

[0050] Moreover, when a high refractive-index layer made titanium oxide a subject based on the component which makes a low refractive-index layer contain in silicon oxide, and when tantalum oxide was made into a subject, a formation ingredient component ratio, then coefficient of thermal expansion, etc. of high refractive-index layers, such as many, agreed titanium oxide, and problems between layers, such as a crack and exfoliation generating, were not produced. [titanium oxide]

[0051] Moreover, drawing 3 shows the gestalt of operation of the 2nd of this invention, among drawing, the same sign is given to the same part as drawing 1 , and the explanation is omitted. Drawing 3 is the explanatory view in which carrying out simple [of the principal part of the lighting system S of a copying machine], and showing it, 2 sets of reflecting mirrors 81 of the long picture by which the cross section was

fabricated with the quartz glass which makes the letter of a curve, or hard glass are formed, and long tubing form tungsten halogen lamp L is arranged in accordance with the focal shaft of these reflecting mirrors 81 and 81. Moreover, the platen 83 on which the copy manuscript 82 is put is formed above these reflecting mirrors 81 and 81.

[0052] And the multilayer light interference film 2 and 2 is formed in front flesh-side (inside and outside) both the front faces of the above-mentioned reflecting mirror 81. Although it consists of what carried out multistory [of quantity refractive-index layer 2H which these multilayer light interference film 2 and 2 as well as what was formed in the above-mentioned tungsten halogen lamp L1 becomes from the mixture of titanium oxide and tantalum oxide, and the low refractive-index layer 2L which made titanium oxide contain in silicon oxide] by turns, it is the coat 2 which reflects the light in optical property and penetrates infrared radiation.

[0053] In the case of this copying machine, only the light which irradiates a manuscript 82 is required for platen 83 direction on which the copy manuscript 82 is put, and as for heat, the temperature rise of equipment is caused on the contrary, and since it is not desirable, a thing, such as carrying out forced discharge from the tooth back of a device, is performed.

[0054] And the abbreviation one half of the light (infrared radiation is also included) to which tungsten halogen lamp L lit up and was emitted at the time of a copy reflects only the light, without carrying out incidence to the reflecting mirrors 81 and 81 which meet tungsten halogen lamp L and are located, and carrying out all light reflexes to them, and goes in the platen 83 direction with the direct solar radiation from an electric bulb L. Moreover, the infrared radiation which carried out incidence to the above-mentioned reflecting mirrors 81 and 81 penetrates the optical interference film 2 and 2 of front flesh-side (inside and outside) both front faces, and is emitted to the tooth-back side of reflecting mirrors 81 and 81. Consequently, the caloradiance to platen 83 direction on which the copy manuscript 82 was put is reduced, and the effectiveness that the temperature rise of a platen 83 can be fallen is done so.

[0055] Moreover, if the coat 2 which has the same light transparency infrared reflex action as the tungsten halogen lamp L1 shown in drawing 1 is formed in the front face of the bulb of tungsten halogen lamp L in this case, radiation of the infrared radiation from the electric bulb itself also decreases, and the fall of the temperature rise of ****** by the side of a platen 83 can be aimed at.

[0056] Moreover, drawing 4 is the perspective view of lighting fitting (lighting system) in which the gestalt of operation of the 3rd of this invention is shown, among drawing, the same sign is given to the same part as drawing 1 thru/or drawing 3 , and the

explanation is omitted. Drawing 5 shows lighting fitting (lighting system) D, and the high-pressure mercury lamp L2 is attached with the reflecting mirror made from a metal plate with which 86 was held in the case and 87 was held in this case 86. Moreover, the multilayer light interference film 2 and 2 (not shown) is formed in inside-and-outside (front flesh side) both front faces by the protective cover member by which 88 was fabricated with wrap hard glass in opening of the above-mentioned case 86.

[0057] Although it consists of what carried out multistory [of quantity refractive-index layer 2H which these multilayer light interference film 2 and 2 as well as the gestalt of the above-mentioned implementation becomes from the mixture of titanium oxide and tantalum oxide, and the low refractive-index layer 2L which made titanium oxide contain in silicon oxide] by turns, they are the filter coats 2 and 2 which penetrate the light in optical property and omit ultraviolet rays.

[0058] This lighting fitting (lighting system) D is energized through lighting devices (not shown), such as a ballast choke, from a power source, makes discharge occur and makes a lamp L2 turn on between the discharge electrodes in a bulb (not shown). Although a bulb and the protective cover member 88 will be emitted to through ultraviolet rays if this high-pressure mercury lamp L2 is turned on, radiation of the ultraviolet rays to the outside of lighting fitting (lighting system) D is cut with the multilayer light interference film 2 and 2.

[0059] In addition, this invention is not restricted to the gestalt of operation mentioned above. For example, the optical interference object as used in the field of this invention means the filter with which the multilayer light interference film was formed, the glass bulb of a bulb, and a reflecting mirror and a bulb for wrap covering etc. Moreover, light-emitting part material means the discharge electrode which confronts each other in a filament and a discharge lamp in an electric bulb.

[0060] moreover, the bulb to which the multilayer light interference film is applied not only in the tungsten halogen lamp shown in the gestalt of operation, or a high-pressure mercury lamp The tungsten halogen lamp L1 which discharge lamps, such as an incandescent lamp of other classes and a metal halide lamp, are sufficient as, and is shown in drawing 5 and which formed the light transparency infrared reflective film 2 and 2 in front flesh-side (inside and outside) both the front faces of a bulb 1, for example, You may be the reflex bulb L3 unified by joining the reflecting mirror 91 of a bowl form in which the light reflective infrared transparency film 2 and 2 was formed, through adhesives 92 to front flesh-side (inside and outside) both front faces, or attaching mechanically.

[0061] And even if it is the electric bulb L1 which formed the light transparency

infrared reflective film 2 in inside-and-outside (front flesh side) both the front faces of the bulb 1 as shown in the gestalt of implementation of the above 1st in the case of this reflex bulb L3 Moreover, the electric bulb L of the gestalt of the 2nd operation which does not form the coat 2 in the front face of a bulb 1 at all even if it is the electric bulb of inside-and-outside (front flesh side) both the front faces of a bulb 1 which formed the light transparency infrared reflective film 2 in the whole surface at least (the configurations of a bulb differ.) you may be -- moreover, even if it has formed the light reflective infrared transparency film 2 and 2 as shown in the gestalt of the 2nd operation in front flesh-side (inside and outside) both the front faces of a reflecting mirror 91 Or what is necessary is just the combination in which all light reflex film, such as aluminum, may be formed in, and the multilayer interference film 2 and 2 concerning [in either / at least / a bulb 1 or the reflecting mirror 91] this invention to front flesh-side (inside and outside) both front faces is formed.

[0062] moreover, the method of the penetration method by not only a thing but the vacuum evaporationo and elevated temperature which formation of the multilayer interference film 2 depends on the immersion to a solution being sufficient as this invention, for example, making formation of a low refractive-index layer contain titanium and a tantalum, when based on vacuum evaporationo -- the duality of both components -- vacuum deposition or the vacuum deposition of the mixture of both components could be used.

[0063] Furthermore, as multilayer light interference film, although the light transparency infrared reflective film, the light reflective infrared transparency film, and the ultraviolet-rays cut-off filter film were explained, even if it applied this invention to other optical film, such as filter film, it was able to aim at improvement in the heat-resistant-like reinforcement similarly.

[0064]

[Effect of the Invention] According to invention according to claim 1, it is carried out in one activity on front flesh-side (inside and outside) both the front faces of a substrate, and the two-layer coat of the formation of the multilayer light interference film can be carried out to coincidence in homogeneous membrane thickness, and while a coat formation activity is easy, that whose optical property also improved can be obtained. Moreover, since it has association with chemical high refractive-index layer and low refractive-index layer by which multistory was carried out while being able to make it front flesh-side (inside and outside) both front faces for 2 minutes, being able to form a coat and being able to reduce a sheet of multistory number, the adhesion force between both layers can improve, and the firm coat which neither a crack nor exfoliation can

make the bottom of hot environments easily can be obtained.

[0065] According to invention according to claim 2, while being able to prevent generating of a crack or exfoliation on the multilayer light interference film under an elevated temperature with the content of the readjustment range, an optical property and a luminescence property can be improved.

[0066] According to invention according to claim 3, above-mentioned claim 1 and claim 2 can be provided with the bulb which has the same effectiveness as a publication.

[0067] According to invention according to claim 4, above-mentioned claim 1 and claim 2 can be provided with the electric bulb and discharge lamp which have the same effectiveness as a publication.

[0068] According to claim 5 thru/or invention according to claim 8, reflex bulbs which equipped above-mentioned claim 3 and claim 4 with the reflecting mirror which has the same effectiveness as a publication, such as an electric bulb and a discharge lamp, can be offered.

[0069] According to claim 9 and invention according to claim 10, the lighting system (lighting fitting) which has above-mentioned claim 1 or effectiveness according to claim 2 can be offered.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] the piece which shows the gestalt of operation of the 1st of this invention -- a mouthpiece -- some form tungsten halogen lamps -- it is a cross-section front view.

[Drawing 2] It is the model-expanded sectional view showing the multilayer light interference film formed in the bulb front face of drawing 1 .

[Drawing 3] It is the explanatory view in which carrying out simple [of the principal part of the lighting system of the copying machine in which the gestalt of operation of the 2nd of this invention is shown], and showing it.

[Drawing 4] It is the perspective view of lighting fitting (lighting system) in which the gestalt of operation of the 3rd of this invention is shown.

[Drawing 5] It is the cross-section front view of a reflex bulb showing the gestalt of other operations of this invention.

[Description of Notations]

1: Glass bulb (translucency substrate)

2: Multilayer light interference film

2H: Quantity refractive-index layer

2L: Low refractive-index layer

6: Light-emitting part material (coiled form filament)

81, 87, 91: Reflecting mirror

L: Tungsten halogen lamp

L1: Tungsten halogen lamp (with the multilayer light interference film)

L2: High-pressure mercury lamp

L3: Reflex tungsten halogen lamp (with the multilayer light interference film)

S: Lighting system

D: Lighting fitting (lighting system)